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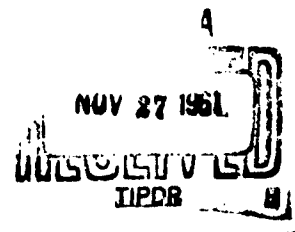
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ERECTION OF QUARTERS BUILDING  
FOR PIONEER POLAR CAMP

TN-102

26 September 1961



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U. S. NAVAL CIVIL ENGINEERING LABORATORY  
PORT HUENEME, CALIFORNIA

NOX  
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ERECTOR OF QUARTERS BUILDING  
FOR PIONEER POLAR CAMP

Y-F015-11-102

Type C

by

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FOREWORD

The U. S. Naval Civil Engineering Laboratory, Port Hueneme, California is developing a 25-Man Pioneer Polar Camp under Task Y-F015-11-102. This camp is to be suitable for construction and operational efforts in remote polar locations. Its anticipated use at a single location is from 60 days to 12 months depending on the operational requirement. For short time use it must be suitable for 50-man occupancy and for long time use, 25-man occupancy.

The 16- x 48-ft modified Jamesway hut described in this technical note has been selected as the basic structure for the Pioneer Polar Camp. The equipment and furnishings to convert it to a 9/18-man living quarters were used in mock-ups made during the camp development. In the final plans for the camp some of the items of equipment and furnishings for the living quarters have been changed, and others are being reviewed for greater simplicity, reduced space or improved performance. Even so, no change in the basic concept of the quarters is planned unless the technical evaluation at FAF, McMurdo, Antarctica during Operation Deep Freeze 62 shows a need for change.

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### GENERAL DESCRIPTION

The Pioneer Polar Camp 9/18-man living quarters shown in Figure 1 includes:

1. A 16-ft wide by 48-ft long Jamesway hut fitted with a 2-ft high NCEL wall extension kit, for a 10-ft high building at the top of the arch.
2. Curtains to divide the interior into 12 semi-separate spaces, nine of which are one- or two-man bedrooms, two are combination lounge-utility areas, and one is a utility area.
3. A single or double bunk in each bedroom and provisions for storing the personal gear of each occupant.
4. General lighting for the hallway, and individual lighting for each bedroom and the lounge areas.
5. A forced hot air heating system, with overhead circulating fans for the primary heating system, and space heaters for stand-by heating in the event of a power failure.
6. Simple, rugged lounge furniture in the stand-by heater spaces at each end of the building.
7. A urinal in the vestibule at one end of the building.

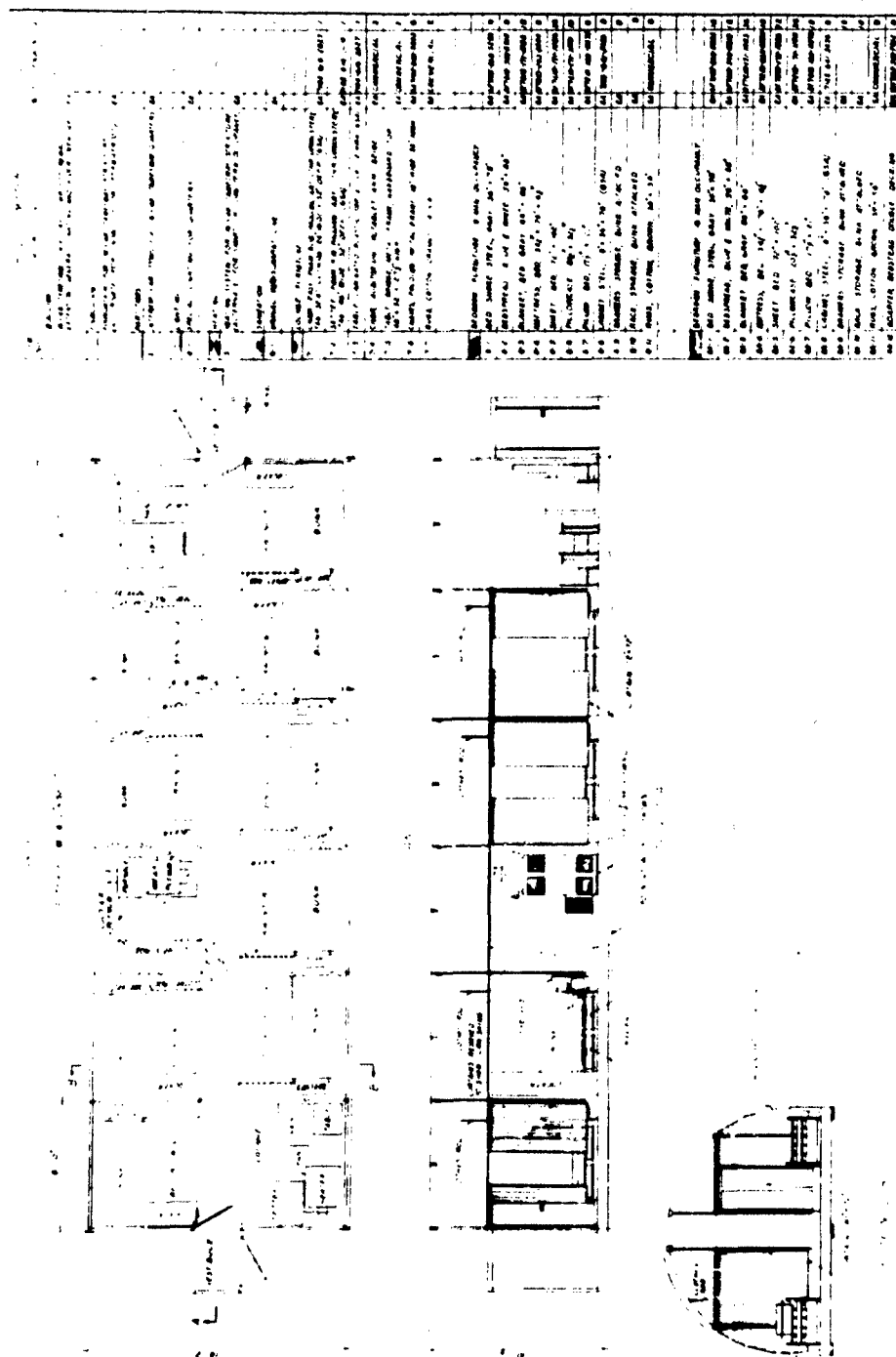


Figure 1. Outfitting and layout of 16- x 48-ft building as 9/18-man quarters.

## FOUNDATION

The building site for the 16- x 48-ft quarters building shown in Figure 1 should be fairly smooth and level. Once this has been accomplished three parallel rows of 2- x 8-in. or 2- x 10-in. timber mud sills should be laid out on the site. These sills, each 48 ft long, should be made up of timbers not less than 12 ft long. The two outside mud sills should be 16 ft apart, out-to-out, and the center of the middle sill should be 8 ft from the outer edges of the outside sills.

The sills should be level with each other. The transverse variance at any given location should not be more than  $1/8$  of an inch and the longitudinal variance should not be more than  $1/4$  of an inch. Six-inch wide shims, not more than 4 ft apart, can be used to adjust the levelness of the mud sills, provided they are 2 in. or less in height. Once the mud sills are placed and leveled, they should be grouted for continuous bearing.

While a Jamesway can be erected directly on uneven ground, most subsequent problems with the structure and its outfitting are avoided by erecting it on a level, firm base.

## FLOOR

Twelve of the packing boxes for the Jamesway hut form the floor of the building. Each floor unit is 4 ft wide by 8 ft long. There are 24 units in the 48-ft building. Figure 2 shows the details of laying out and connecting these floor units together.

As the building is fitted with a wall extension kit, the floor units have been modified with fasteners for attaching this kit to the floor. The floor units must be placed so that these fasteners are located around the outside edges of the floor assembly.

To attach the side wall extension panels, one end of each floor unit is fitted with a link-lock fastener (Fig. 3). These fasteners must be located along the outside edges of the floor assembly. Four floor units have two link-lock strikers (Fig. 3) along one edge, as well as a fastener on one end. As the strikers are used to secure the end-wall extensions, these floor units must be located at the ends of the floor assembly.

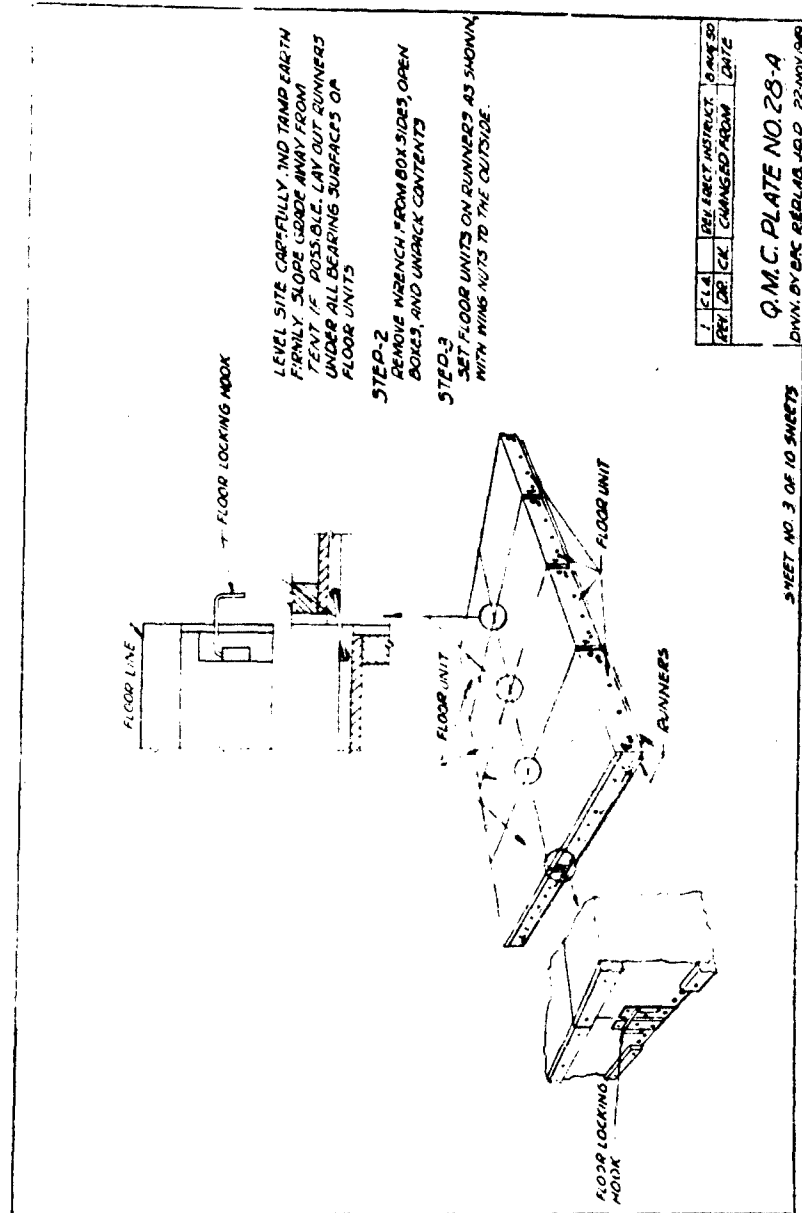


Figure 2. Details of laying out and connecting the floor units together.



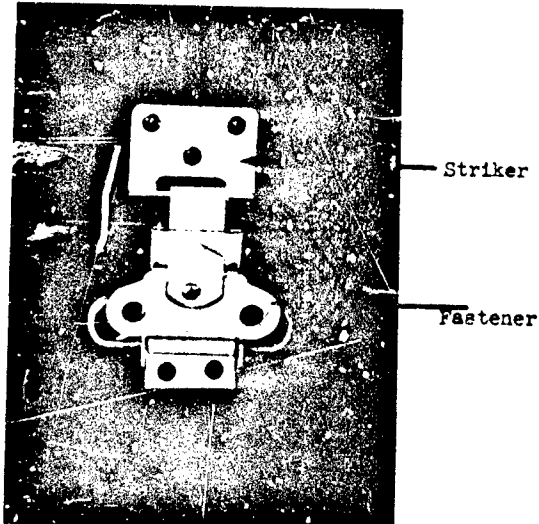


Figure 3. Link-lock fasteners used to connect the Wall Extension Kit to the floor units.

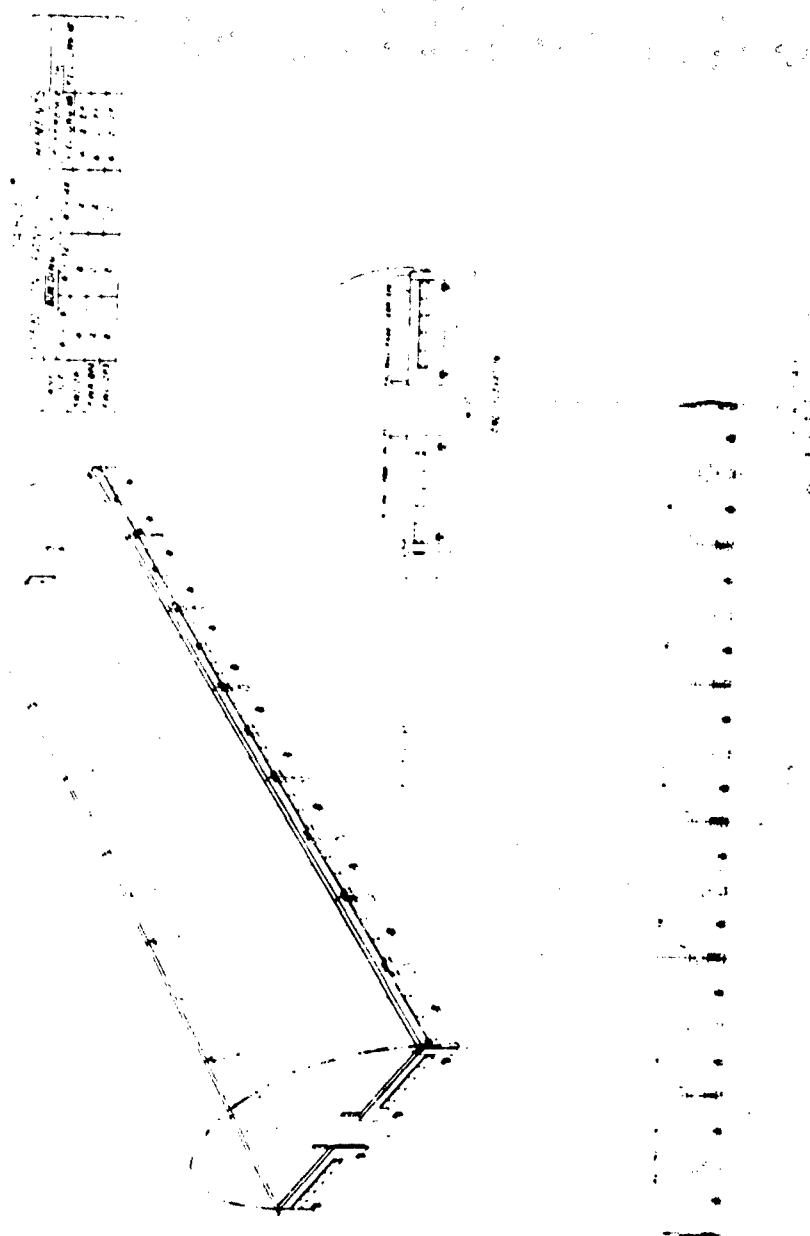


Figure 4. Details of Wall Extension Kit.

#### WALL EXTENSION KIT

After the floor units are assembled, the wall extension kit is erected around the outside edge of the floor as shown in Figure 4. Six extension panels are used on each side of the building and two on each end; they are secured to the floor units with the link-lock fasteners (Fig. 3). For positive locking the fastener and its corresponding striker must be in alignment. Misalignment indicates that the floor units are not properly butted together. This is easily corrected, as the floor units are not fastened down.

After the extension kit is locked to the floor (Fig. 5) its corner panels are secured to each other with wood screws (Fig. 6). The end wall panels are secured to the floor at the door openings with wing nuts.

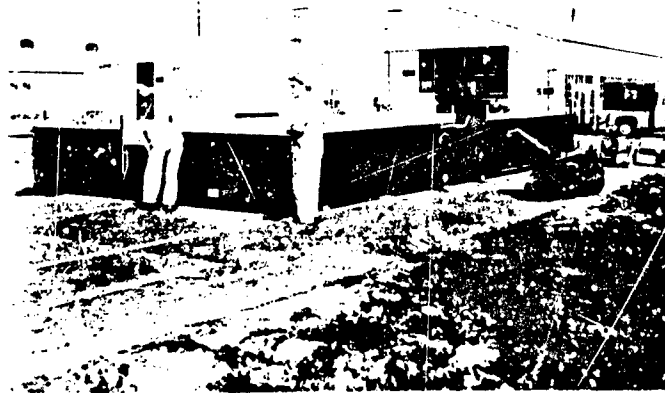


Figure 5. Wall Extension Kit assembled on floor.  
Note door opening between end sections.



Figure 6. Corners of the Wall Extension Kit are connected together with plywood plates and wood screws.

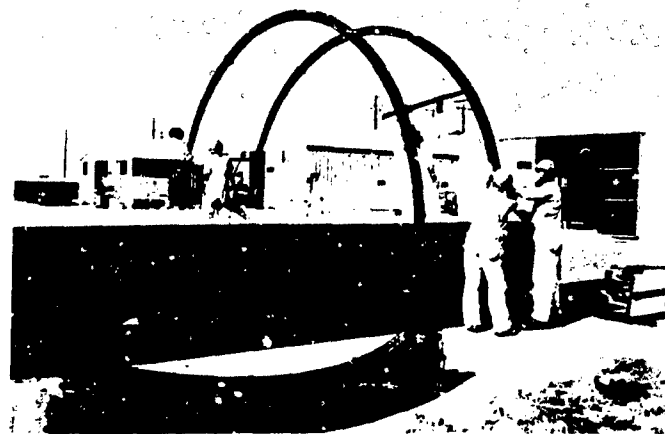


Figure 7. Arched-ribs of Jamesway structure are erected on top of the Wall Extension Kit. Note man placing purlin between ribs.

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#### ARCHED-RIB FRAME

The arched-rib frame of the Jamesway is erected on top of the wall extension kit. It consists of 13 arched-ribs, spaced on 4-ft centers. Each adjacent pair of arched-ribs is connected together around the arch with 2 purlins.

Erection of the arched-ribs should start at one end of the building (Fig. 7). As each rib is raised into position, the slotted metal plates on each end of the rib are slipped onto bolts located in the side wall extension panels (Fig. 8). The ribs are then secured with the wing nuts on these bolts.

The purlins are positioned and held in place with metal keepers around the faces of the ribs. Figure 7 shows a purlin being dropped into place.

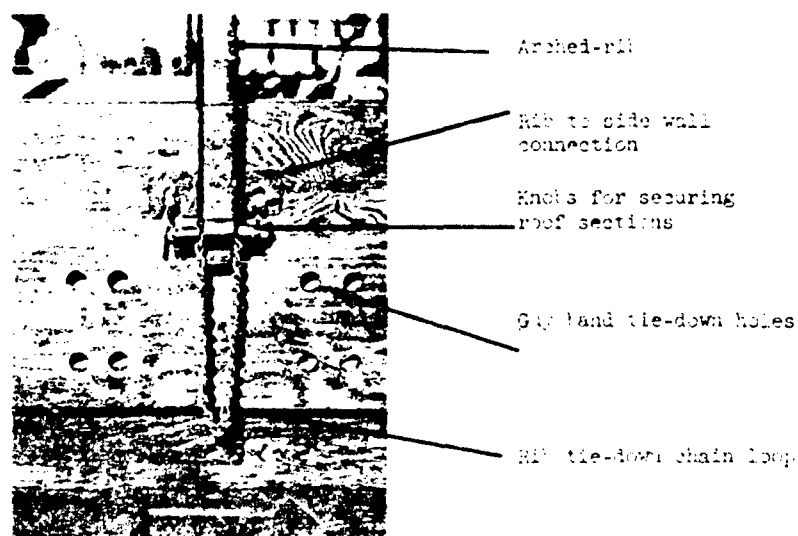


Figure 8. Details of arched-rib connection on Wall Extension Kit.

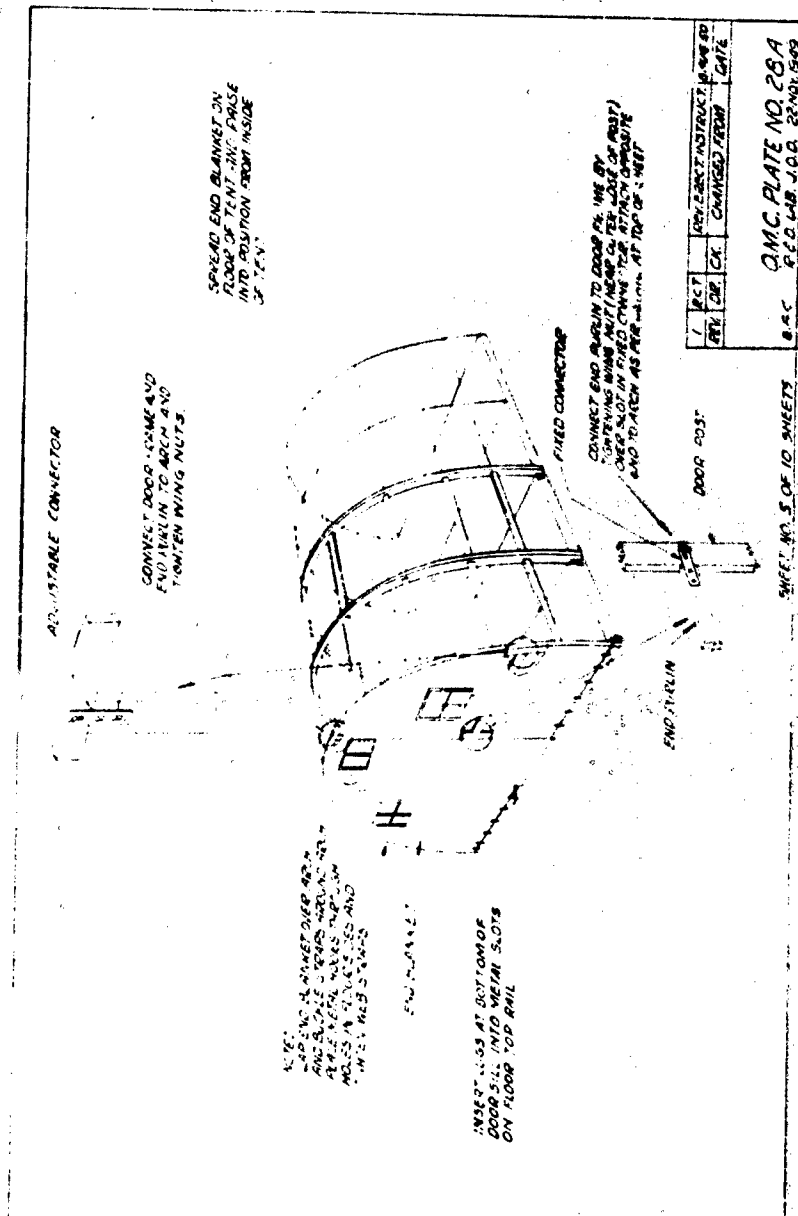


Figure 9. Details for attaching end-wall closure.

#### END-WALL CLOSURE

After the arched-rib frame is erected, one end-wall closure is attached as shown in Figures 9 and 10. This closure is a complete unit containing the frame, door, windows and blanket cover for the end wall.

The other end-wall closure can be erected at the same time or its erection can be delayed until most of the roof cover is in place. In any event, it must be erected before the adjacent roof-cover section is placed.

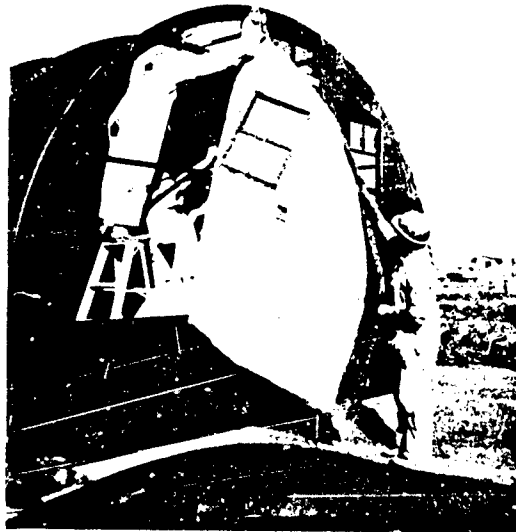


Figure 10. Assembly of end-wall closure.





#### VESTIBULES

An entrance vestibule is furnished for each end of the building; details for erecting the vestibules are shown on Figure 13.

#### TIE-DOWNS

Eleven roof guy bands, four end guy lines and twenty-six 12-in. long metal tent pins are included for tying down the building; details for installing these tie-downs are shown in Figure 14. In addition, twenty-six 36-in. long steel pins are included to tie down the ends of the arched-ribs; these pins are hooked to the ribs with the chain loops attached to the end of the ribs (Fig. 8).

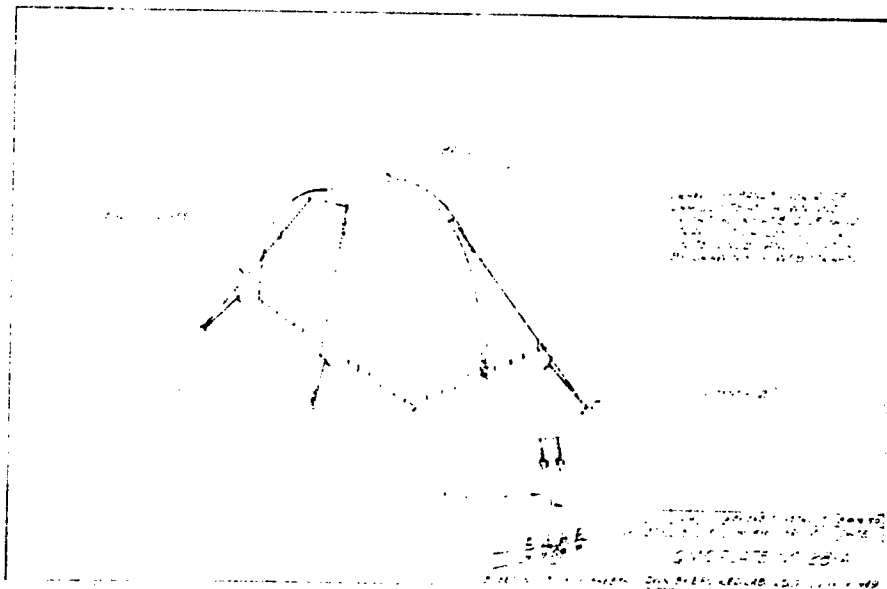


Figure 14. Details of assembly for roof and end wall tie-downs.

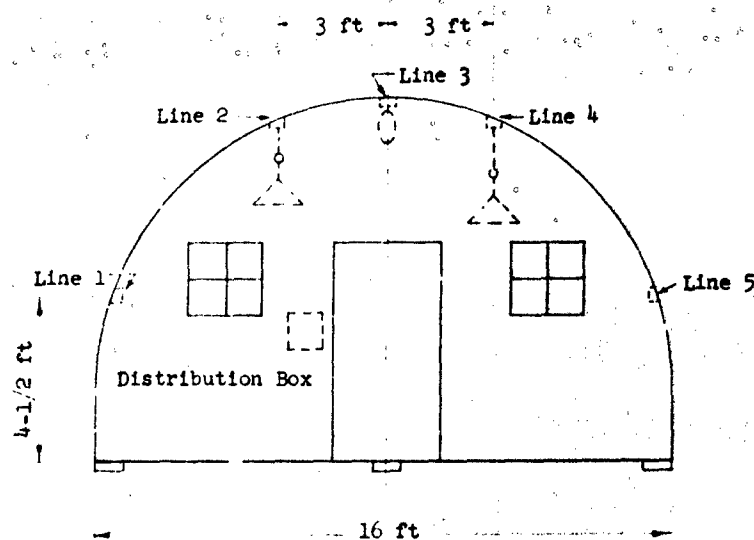


Figure 15. Location of prefabricated electrical lines.

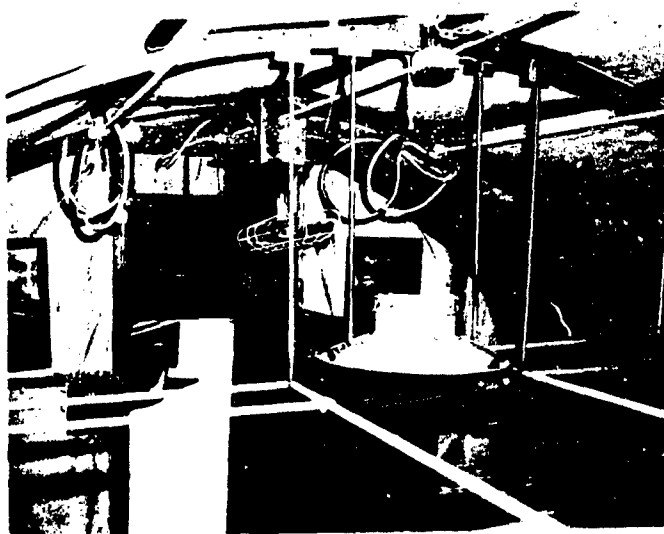


Figure 16. Mounting details of electrical lines and distribution box, hot air diffusers, fans and partition frame.

## ELECTRICAL SYSTEM

The electrical distribution system consists of a multi-breaker type distribution box and six circuits. These circuits, which extend the full length of the building, are contained in five prefabricated conduit lines located around the inside of the building as shown in Figure 15. Two convenience outlet lines, located about 4-1/2 ft above the floor, contain one circuit each; they are designated as Lines 1 and 5. Two overhead light lines, located 3 ft on each side of the center of the building, also contain one circuit each; they are designated as Lines 2 and 4. A line located directly overhead in the center of the building contains two circuits, one for warm air circulating fans and one for the night lights; it is designated as Line 3.

Each line is made up of prewired sections of 1/2-in. lightweight conduit normally fitted with electrical boxes on one end and male compression fittings on the other. The electrical boxes contain matching female compression fittings. Thus, the lines can be made up simply by plugging the sections of conduit together and tightening the attached locking nuts.

The conduit section at the beginning of each line contains a length of prewired, 1/2-in. flexible conduit (Fig. 16) for connecting the line to the electrical distribution box.

The conduit section at the end of each line is fitted with two electrical boxes, but only one box contains a female compression fitting.

Layout of the five prefabricated electrical lines and location of the distribution box is shown in Figure 17.

Lines 1 and 5 are made up of six sections of conduit wired with two No. 12 electrical wires. Each includes:

1. Four 96 in. long sections fitted with one 4-in. square box containing two duplex outlets
2. One 98-1/2 in. long section fitted on both ends with 4-in. boxes containing duplex outlets
3. One 96 in. long section with a length of flexible conduit attached to its single duplex outlet box

As shown in Figure 15, Lines 1 and 5 are located on the sides of the building. Each line should be made up on the floor, then lifted up and attached to the lowest purlin in the arched-rib frame. The boxes should rest on the ribs in order that their brackets will fit tightly over the purlins.

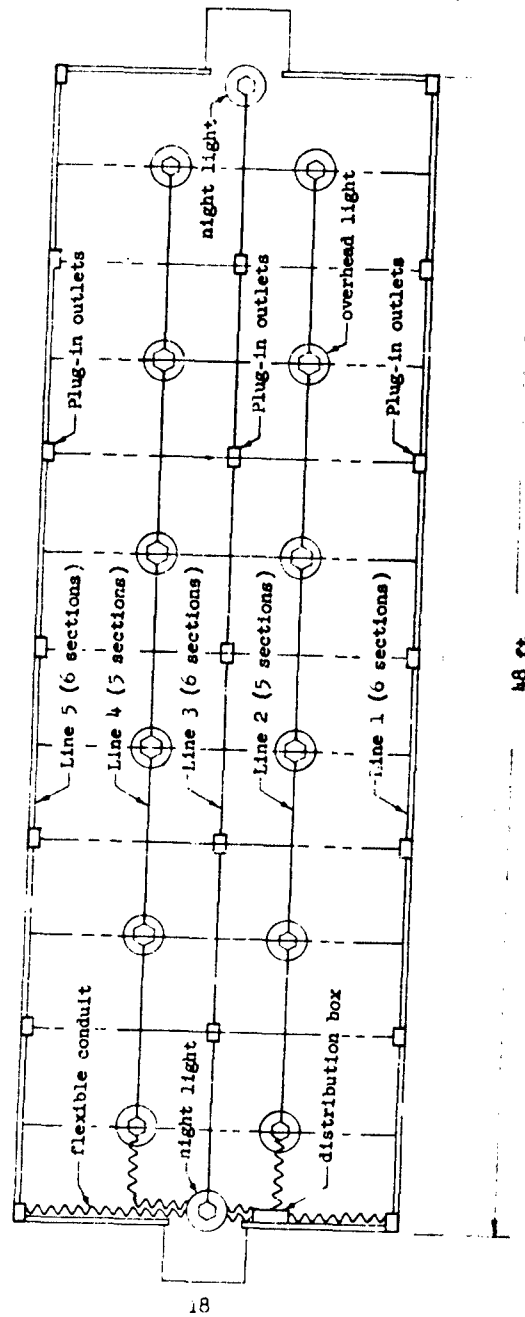


Figure 17. Layout of electrical distribution lines in quarters building.

Lines 2 and 4 are made up of five sections of conduit wired with two No. 12 electrical wires. Each includes:

1. Three 96-in. long sections fitted with one 3-1/2-in. hexagonal box wired to receive an overhead light fixture

2. One 99-1/2 in. long section fitted on both ends with hexagonal boxes

3. One 96-in. long section with a length of flexible conduit attached to its single hexagonal box

As shown in Figure 15, Lines 2 and 4 are located on the overhead, near the center of the building. Like Lines 1 and 5, each line should be made up on the floor, then lifted up and attached to the purlins. As shown in Figure 17, these lines begin and end 4 ft from the ends of the building. The boxes should rest on the ribs in order that their brackets will fit tightly over the purlins.

Line 3 is made up of six sections of conduit. As it contains two circuits, each section is prewired with two No. 12 wires and one No. 14 wire, the No. 12 wire is blue and white, and the No. 14 wire is black. This line includes:

1. Four 96-in. long sections fitted with one 4-in. square box containing two duplex outlets

2. One 95-1/4 in. long section fitted on one end with a 4-in. box containing duplex outlets and on the other end with a 3-1/2 in. hexagonal box fitted for a night light

3. One 92-1/2 in. long section with a length of flexible conduit attached to its single hexagonal box

As shown in Figure 15, Line 3 is located at the top of the building. Like the other lines, Line 3 should be made up on the floor, then lifted up and attached to the purlin at the top of the building. The boxes should rest on the ribs in order that their brackets will fit tightly over the purlins.

When the five lines are assembled and in place, the flexible conduit is pulled across the end of the building and wired into the distribution box. This box is located on the end wall purlin adjacent to the door. (see Figs. 15 and 16.)

The overhead light fixtures are attached to the boxes on Lines 2 and 4; the night lights are attached to the end boxes on Line 3. Electrical connections for these fixtures can be made without solder and tape.

No material is furnished for connecting electrical power to the distribution box.

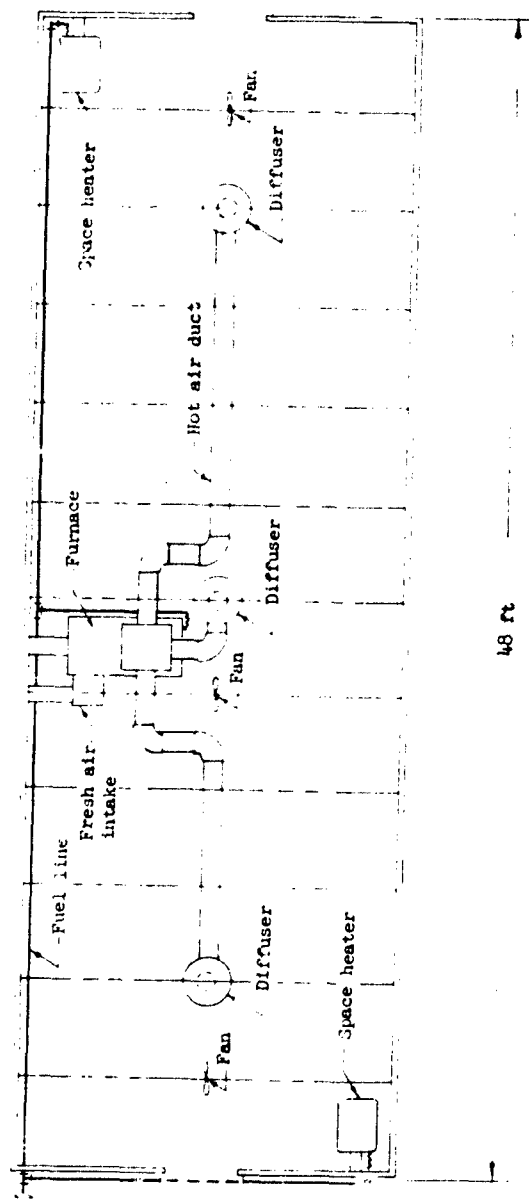


Figure 18. Layout of heating system in quarters building.

## HEATING SYSTEM

A dual heating system is provided for the Quarters Building. It consists of a 151,000 Btu/hr hot air furnace with hot air ducts, diffusers, fans, and fresh air inlet for use when continuous electrical power is available, and two natural draft 50,000 Btu space heaters for emergency use without electrical power.

Hot Air Furnace. Install the hot air furnace as follows:

1. Locate the furnace as shown in Figure 18; leave a distance of 19 in. between the back of the furnace and the wall. In the other direction, the furnace should be positioned so that the smoke pipe opening in the furnace is centered between the arch-ribs.
2. Install the firebrick and mount the oil burner in accordance with the instruction manual for the burner.
3. Project the 9-in. smoke pipe opening, on the furnace, to the wall of the building and install the wall jack (Fig. 19) at this location.
4. Run the section of 9-in. smoke pipe, containing the draft regulator, from the furnace to the outside of the building through the wall jack; then, install an elbow and run the pipe up the building until it is at least 2 ft higher than the top (Fig. 20). All joints in the smoke pipe should be secured with sheet metal screws.
5. Wire the furnace into the nearest box on the convenience outlet circuit behind the furnace. Check all wiring at this time.
6. Connect the furnace to the fuel line as shown in Figure 18. Start the furnace and check it for proper operation.
7. Check the rotation of the furnace blower. The rotation should correspond with the arrow on the blower case. If it is rotating in the wrong direction, reconnect the wires in the motor terminal block for proper rotation.

Fresh Air Inlet. Use of the 9-in. fresh air inlet duct for the furnace is optional. If used, an opening will have to be cut through the side wall of the building for its installation. Sheet metal collars are provided for sealing this opening, and sufficient pipe and fittings are provided to run the intake about 4 ft up the outside of the building. A damper is provided in the cold air plenum to regulate the intake of fresh air. All joints in the intake should be sealed with the 3-in. wide pressure sensitive tape provided with the heating kit.

Hot Air Distribution. Three hot air ceiling diffusers, and the necessary ducts to connect them to the furnace, are included with the heating kit. The diffusers are located along the center line of the

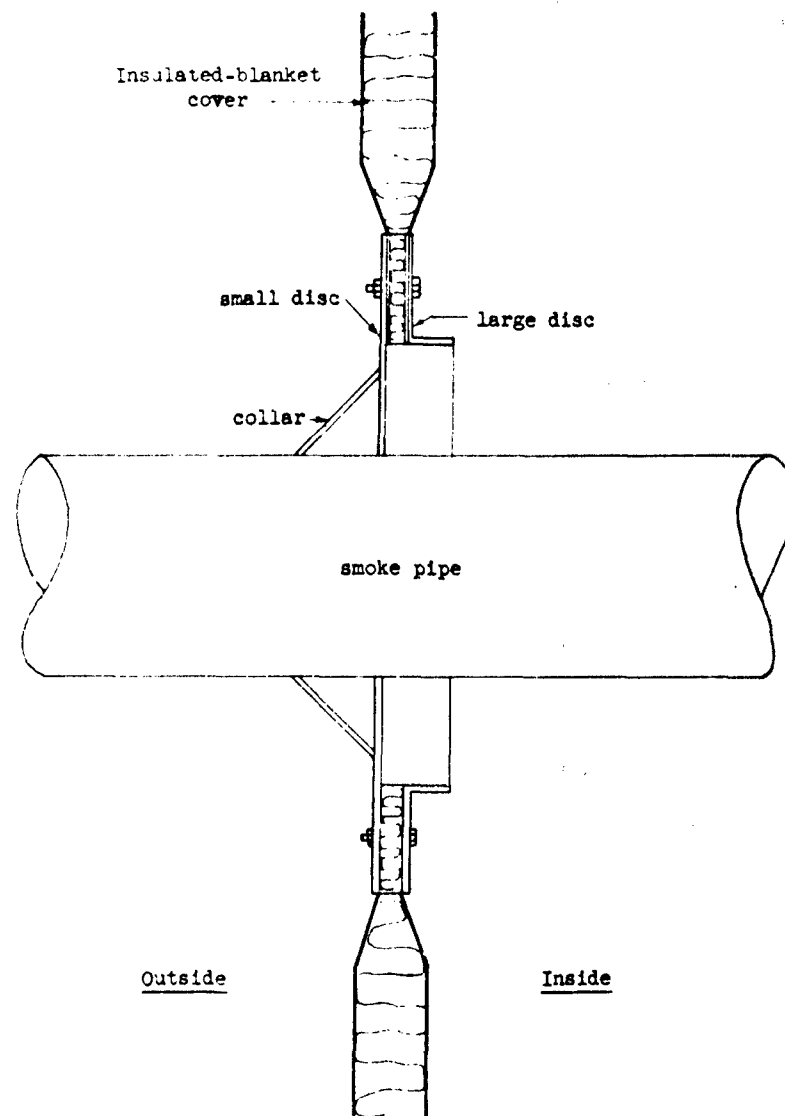


Figure 19. Details of wall jack for smoke pipes.



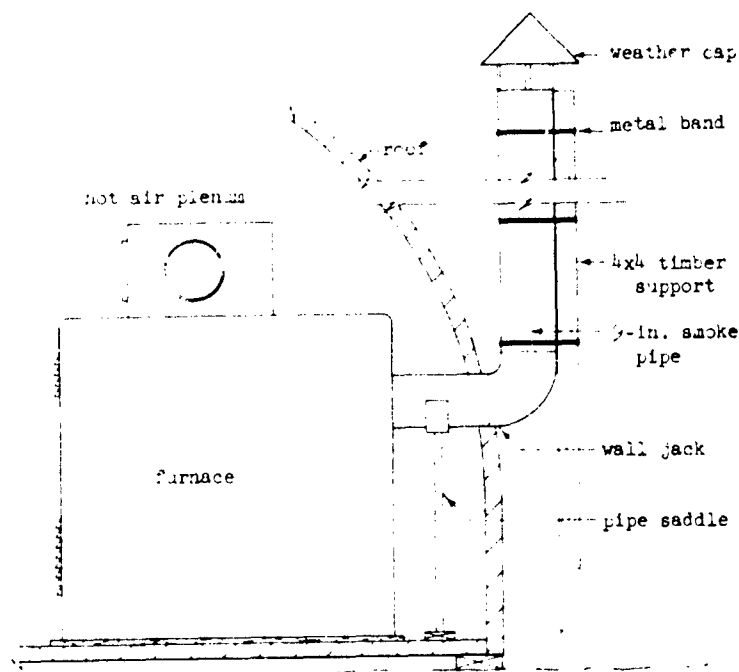


Figure 20. Details of smoke pipe for hot air furnace.

building, as shown in Figure 19; they are connected to the hot air plenum on the furnace with 10-in. ducts. For installation:

1. All three diffusers are bolted to the arched-ribs of the building (Fig. 16). One is located on the rib at the center of the building and one each on the ribs 8 ft in from each end wall.
2. The 10-in. pipe duct to each diffuser requires three elbows (Fig. 18): one at the hot air plenum, one at the center of the building and one at the diffuser.
3. The ducts are sealed with the 3-in. wide pressure sensitive tape furnished with the heating kit.
4. Each diffuser contains a damper, for regulating the amount of air discharge. A lever, located between the cones, in the diffuser, is provided to adjust the damper. The direction of air discharge from the diffusers can be changed by adjusting the Allen screw in the center of the diffuser; this raises or lowers the cones.



Figure 21 Details of smoke pipe for space heater.

Warm Air Circulation. In addition to distributing hot air from the furnace through diffusers, electric fans are provided for circulating this air through the building. Like the diffusers, these fans are suspended from the arched-ribs along the center line of the building (Fig. 15).

1. All three fans are bolted to the arched-rib as shown in Figure 16. One is located near the center of the building next to the middle diffuser, and the other two are located on the ribs 4 ft in from each end wall.

2. Hang the fans with the blades in a horizontal position so that they blow straight down.

Space Heaters. Install the space heaters in opposite corners of the building (Fig. 18) as follows:

1. Precut panels of asbestos board are provided to protect the blanket walls of the building from excessive heat. Position these panels in the corner of the building, behind the heaters, and secure them to the building framing with sheet metal screws.

2. Position the heaters, project the center line of the smoke pipe openings to the end walls, and install wall jacks at these locations. Details of this installation are shown in Figure 19.

3. Run a vertical section of smoke pipe from the heaters through the wall jacks (Fig. 21). The draft regulators should be located inside the building, in these runs of smoke pipe. Outside the building, fit the smoke pipes with elbows and run the pipes up the ends of the building until they are about 2 ft above the roof. Secure the sections of smoke pipe with sheet metal screws and guy the outside vertical run of pipe to the building with metal wire.

4. Connect the fuel line shown in Figure 18 to the space heaters with the 3/8-in. copper tubing provided for this purpose.

Fuel Supply. Pipelines for distributing the fuel from a single supply tank to both space heaters and the furnace are shown on Figure 18. These lines, which start with a gate valve and tee at one corner of the building, are made up of 8-ft sections of 1/2-in. diameter, black iron pipe.

The 48-ft leg of the fuel line is located inside the building. It lies on the floor adjacent to the side wall. A tee, gate valve and 5-ft length of black iron pipe are provided for running this line out to the furnace. Final connection to the furnace is made with 3/8-in. diameter copper tubing. A gate valve and copper tubing are provided for connecting the end of the line to one space heater.

The 16-ft leg of the fuel line is located outside the building along the bottom of the end wall. An elbow, nipple and gate valve are provided for running this line through the end wall at the second space heater. Final connection to this heater is made with copper tubing.

No fuel supply tank is furnished with the building. This tank can be made up from one or more interconnected 55-gallon fuel drums. They should be elevated at least 18 in. above the floor of the building for good gravity flow.

#### PARTITIONS

As shown in Figure 1 the interior of the building is divided into 12 spaces, with curtains supported overhead on a lightweight pipe frame. This frame, assembled with slip-on fittings, is supported from the arched-ribs and purlins; it is made up of the following pieces:

1. End Suspension Rods. These rods, which are about 3 ft long, are fitted on one end with a flat plate for bolting them to the arched-ribs and on the other end with "L" shaped connectors to support the curtain hangers.

2. Intermediate Suspension Rods. These rods are similar to the end suspension rods except that they are fitted with "T" shaped connectors to support the curtain hangers.

3. Transverse Curtain Hangers. These hangers, made of 3/4-in. conduit, are 5 ft 2-1/2-in. long. One end is open to fit the suspension rod connectors and the other end is "U" shaped to hook onto a purlin in the building frame.

4. Longitudinal Curtain Hangers. These hangers, made of 3/4-in. conduit, are 7 ft 11-1/2 in. long; both ends are open to fit the suspension rod connectors.

5. Longitudinal Curtain Hanger End Pieces. These hangers, made of 3/4-in. conduit, are 8 ft 1 in. long. One end is open to fit the suspension rod connector, and the other end is curved and fitted with a plate shoe for attaching to the door frame.

Assembly of the frame on each side of the building must start at the lounge area (Fig. 1); the sequence of assembly is as follows:

1. An end suspension rod is bolted to the second arched-rib, 8 ft from the end wall (Fig. 16) at a point 1 ft 3 in. from the center line of the building. The exact location can best be determined by connecting a transverse curtain hanger to the suspension rod and hooking it on the purlin adjacent to the second rib. The purlin, 5 ft 9 in. above the floor, is used to support this hanger.

2. Next, hang an intermediate suspension rod on the arched-rib 16 ft from the end wall. However, before tightening the bolts that support this rod, fit a longitudinal curtain hanger between the end and intermediate rods, and a transverse curtain hanger between the intermediate rod and the purlin. When these hangers are in place, tighten the bolts that support the suspension rod.

3. The sequence of assembly is the same for the next two sections of the frame.

4. The last piece to be placed is the longitudinal curtain hanger end piece. Its open end is slipped onto the last suspension rod hanger; it is pushed up the door frame until level and attached with wood screws.

Three sizes of curtains are provided to enclose the spaces in the building (Fig. 1); these are:

1. Wall Curtains. The wall curtains are used in the building to separate the bedrooms. They are cut along one edge to fit the arched-ribs. Tacks or staples are used to support these curtains from the ribs. One wall curtain is used between each bedroom.

2. Room Divider Curtains. The room divider curtains are 90 in. wide by 72 in. long. They are suspended from the transverse curtain hangers by shower hooks. One room divider curtain is used between each bedroom.

3. Hall Curtains. The hall curtains are 72 in. wide by 72 in. long. They are suspended from the longitudinal curtain hangers by shower hooks. Two hall curtains are used to separate each bedroom from the hall.

#### FURNISHINGS

The bedroom and lounge furniture, furnished with the building, are shown in Figure 1. Most of these are standard Navy Stock items; however, to provide extra storage in the bedrooms, knockdown under bunk drawers (Fig. 22) and headboard shelves (Fig. 23) are provided for each bedroom.



Figure 22. Prefabricated, knockdown drawers furnished for under bunk storage.

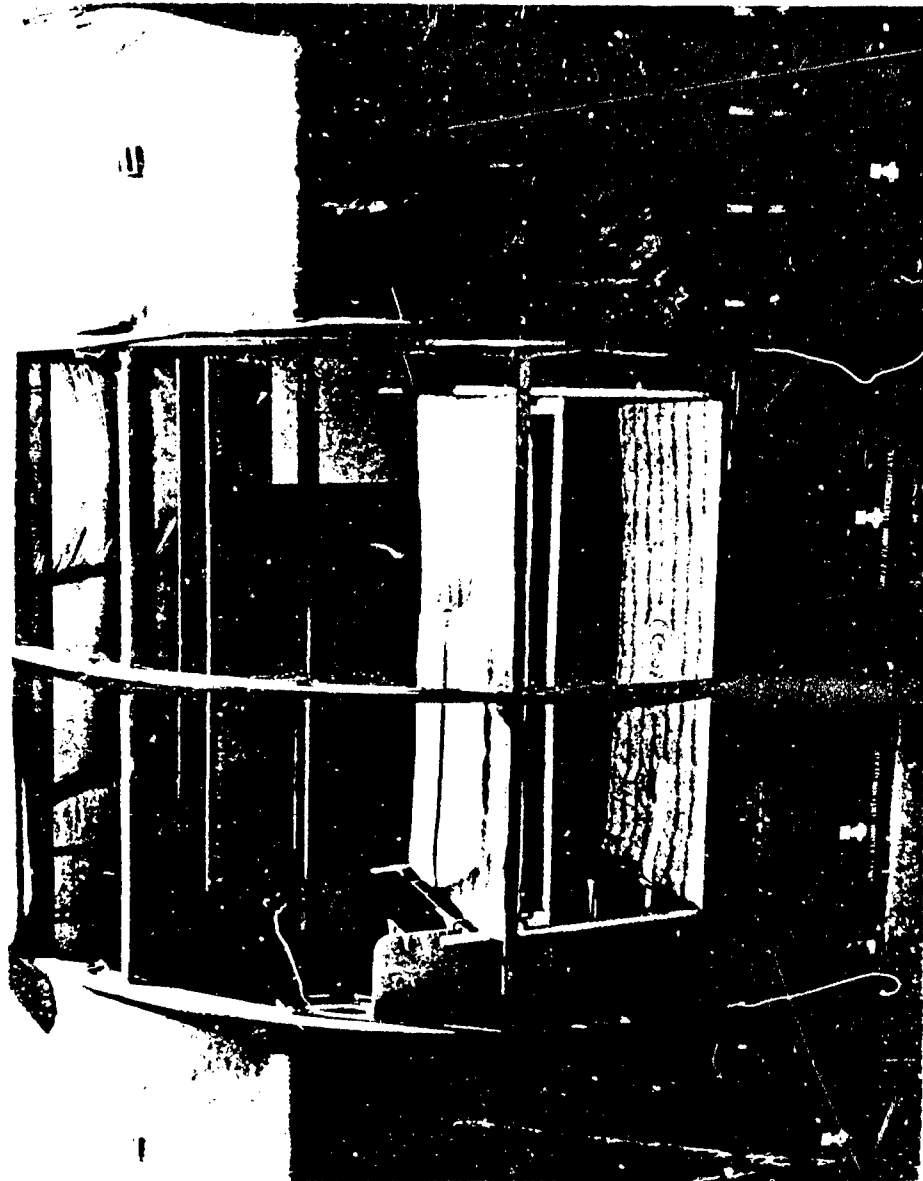


Figure 23. Prefabricated, knockdown shelves furnished for headboard storage.

PACKING OF QUARTERS BUILDING AND EQUIPMENT FOR SHIPMENT TO ANTARCTICA

COMPONENT	PACKAGES (No.)	NET WEIGHT (lb)	GROSS WEIGHT (lb)	CUBE (ft <sup>3</sup> )
Basic 16 x 48-ft Jamesway	20	5,772	8,337	813.9
Wall Extension Kit	7	1,073	1,675	154.3
Heating System				
Space Heaters	3	234	380	44.1
Furnace & Appurtenances	9	1,174	1,689	159.1
Electrical System	3	306	492	56.8
Partitions	3	359	470	21.2
Floor Covering	2	770	960	28.4
Furnishings	33	4,467	6,680	557.7
TOTALS	80	14,155	20,683	1,835.5

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